

lower submerged portion and that longitudinal area of egg free from investing capsule to escape and wriggle freely to the depth of the water. The egg remains doubled upon itself with a wide gaping aperture along its longitudinal aspect, the margins of which are thrown into folds, and an irregularly torn vent at its submerged base (Plate III, fig. 5).

THE MOSQUITOES OF THE PALAEARCTIC AND NEARCTIC REGIONS

(*Diptera, Culicidæ*)

BY HARRISON G. DYAR

In the November, 1921, number of the "Bulletin of Entomological Research," Mr. F. W. Edwards gives a valuable review of our present knowledge of the palaeartic mosquitoes. The region included is far too extensive for a direct comparison with the North American fauna, as it extends to northern Africa and in the east to Japan; but by selecting those species inhabiting the region in Europe that corresponds to our Canadian region, the comparison becomes instructive. It appears that the palaeartic and nearctic faunae were continuous at a comparatively recent date. Some of the more stable species are identical, others are racial, others representative, and the rest are derivatives. There are no species proper to the fauna which have a diverse origin.

In some details it seems necessary to dissent from Mr. Edwards's conclusions. Exactly what degree of difference constitutes a species and what a geographical race or variety is more or less a matter of individual opinion. I think that where constant differences appear in any stage that specific rank is indicated, and treat the forms accordingly in the following.

Genus *Anopheles* Meigen

The only species occurring in our Canadian fauna is *occidentalis* D. & K. Mr. Edwards considers this the same as the European *maculipennis* Meig. He has considered the differen-

tial points indicated by me, and finds them insufficient for even racial separation. Apparently the former connection between the old and new worlds was by way of Alaska, and this species, inhabiting the west of America, has not differentiated itself in the two areas. The synonymy may presumably be accepted, as follows:

Anopheles maculipennis Meigen.

Anopheles maculipennis Meigen, Syst. Besch. Zweif. Ins., i, 11, 1818.

Anopheles occidentalis Dyar & Knab, Proc. Biol. Soc. Wash., xix, 159, 1906.

Anopheles lewisi Ludlow, Psyche, xxvii, 74, 1920.

Anopheles selengensis Ludlow, Psyche, xxvii, 77, 1920.

Our eastern *A. quadrimaculatus* Say is a distinct species, while our *A. barberi* has a representative species in the European *A. plumbeus* Steph. The distribution of both of the American species is distinctly more disconnected from the north than that of *A. maculipennis*, and the differentiation is correspondingly greater. Our species *A. walkeri* Theo. and *A. atropos* D. & K. are not referred to by Mr. Edwards, but are probably derivatives of the same stock. *A. crucians* Wied. and *A. punctipennis* Say may not be of holarctic origin.

Genus **Uranotaenia** Lynch A.

The species cited from the Mediterranean region and Japan are wholly unrelated to the North American forms, showing that this genus reached us from the south.

Genus **Culiseta** Felt

Only one of the species is common to the new and old worlds, *C. alaskaënsis* Ludlow, which has a western distribution with us. Edwards finds *siberiensis* Ludl. and *arctica* Edw. to be synonymous, and the distribution to include all of northern Asia and Europe, Siberia, Archangel, Sweden and Scotland, as well as the Alpine regions of Austria and Upper Silesia. A description of the larva was given by me (Ins. Ins. Mens., vii, 33, 1919).

The European *C. annulata* Schr. finds a representative with us in *C. maccrackenae* D. & K., and *C. glaphyoptera* Schin. in *C. impatiens* Walk. Our *C. incidens* Thom. seems to have no European representative, which is surprising, as *incidens* has both western and northern distribution and by the usual rule might be expected to occur intact in Europe. The isolation of *C. inornatus* Will. is more comprehensible, as this has a southern distribution with us and disappears toward the north, being thus well disconnected.

The subgenus *Culicella* has two representatives in Europe, only one with us, namely, *C. dyari* Coq., representing the European *C. morsitans* Theo.

Genus *Orthopodomyia* Theob.

Quite unexpectedly our single species has reached us from the north, *O. signifer* Coq. having a near representative in the European *O. pulchripalpis* Rond. The other known species have a tropical distribution, and the natural supposition would be that *O. signifer* came from the south. The opposite conclusion, however, is clearly indicated.

Genus *Mansonia* Blanch.

This case exactly parallels that of *Orthopodomyia*, our *M. perturbans* Walk. having a near European representative in *M. richiardii* Fic. The other *Mansonia* are of tropical distribution, and one of these forms has actually reached us in southern Florida, *M. titillans* Walk.

Genus *Aedes* Meigen

Taking the groups of the subgenus *Ochlerotatus* as defined by me (Ins. Ins. Mens., viii, 105-106, 1920), the *serratus* and *scapularis* groups are unrepresented in Europe, as befits their southern distribution and evident origin.

Group *pullatus*

This group appears remarkably stable, as three out of our four species are still existing unaltered in Europe. *A. aurifer* Coq. seems to have no European representative, and is probably

an American derivative, considerably altered from the ancestral type. *A. muelleri* Dyar, occurring in the mountains of Mexico, has genitalia of *pullatus* and coloration of *diantaeus*, a synthetic form. The following synonymy is given:

Aëdes diantaeus Howard, Dyar & Knab.

Aëdes diantaeus Howard, Dyar & Knab, Mosq. No. & Cent. Am. & W. I., iv, 758, 1917.

Aëdes serus Martini, Arch. f. Schiffs- u. Trop., xxiv, Beih. i, 96, 1920.

I have examined specimens of *serus*, received from Dr. Martini, and can confirm the synonymy. No difference is apparent in any stage between American and European examples.

Aëdes pullatus Coquillett.

Culex pullatus Coquillett, Proc. Ent. Soc. Wash., vi, 168, 1904

Aëdes acrophilus Dyar, Ins. Ins. Mens., v, 127, 1917.

Culex jugorum Villeneuve, Bull. Soc. Ent. France, 1919, 58, 1919.

Aëdes metalepticus Dyar, Ins. Ins. Mens., viii, 51, 1920.

Aëdes gallii Martini, Arch. f. Schiffs- u. Trop., Beih. i, 110, 1920.

Edwards lists the European form as var. *jugorum*, but it appears to me that the characters cited are without especial value. The apparent stoutness of the claspette stem and basal spine vary with the preparation, while the whiteness of the mesonotal vestiture may be due to fading. I have seen old specimens of American *pullatus*, caught on the wing, which were almost as white as the specimens submitted to me by Prof. Bezzi. This species seems unusually subject to fading even during life.

Aëdes intrudens Dyar.

Aëdes intrudens Dyar, Ins. Ins. Mens., vii, 23, 1919.

Mr. Edwards has seen a male of this species taken by H. Loew in 1844, presumably in the Posen district of Germany. The form must be very rare, for it has not reoccurred in recent European collections. Mr. Edwards states that he cannot distinguish this species by coloration from *pullatus* or *communis*; but this must be due to lack of familiarity with the insect.

The generally uniformly brown mesonotum separates it easily in my experience.

Group *punctor*

Edwards lists two species in Europe of this group, to both of which he cites American names. *Aedes punctor*, var. *meigenanus* Dyar represents our *punctor*, and *A. sticticus* Meig. represents the *hirsuteron* subgroup. To the latter *A. aldrichi* is cited as a synonym with a query. Unfortunately I have not seen any specimens of *sticticus*, and for this reason stated that the group was unrepresented in Europe (Ins. Ins. Mens., ix, 69, 1921). This statement is to be corrected; but I do not think that Mr. Edwards has established the identity of *sticticus* with any American species. It is doubtless a close representative, and appears to have the same habits. Eckstein is quoted as stating that the larvae occur in flooded meadows, together with *vexans* and *dorsalis*, and to pass through several generations during a year. With us, *dorsalis* does not occur in flood-water with the other species, but the habits of that are not here under discussion. The appearance of having several generations may be due to successive hatchings in different floods, an appearance often noted with us and commented on by me (Ins. Ins. Mens., v, 113, 1917). If *sticticus* is to replace any American name, it will be *hirsuteron* or *aestivalis*, and not *aldrichi*, which is a smaller form having the mesonotal stripe divided.

In regard to *punctor*, we have a number of very close species in America, from which the European form seems specifically detached. I am therefore not inclined to depart from my position previously discussed (Ins. Ins. Mens., ix, 72, 1921), and consider that the European form should be called *Aedes meigenanus*, and that *punctor* is its American representative.

Group *impiger* (*decticus*)

Under *Aedes communis* De Geer, Edwards gives *lazarensis* F. & Y. as an absolute synonym and *tahoënsis* Dyar and *pionips* Dyar as synonyms with a query. In regard to the former, I have examined mounts of the hypopygium of European speci-

mens and find the setae of the outer lobe of side-piece stouter than in the American form. The coloration is very similar. I am of opinion that the American form is a race of the European, and should be classified as *A. communis lazarensis*. I have already referred *tahoënsis* as a race, which may now stand *A. communis tahoënsis*. In regard to *pionips*, a distinct species is clearly involved, as the larval differences are striking. The species is larger, and though the markings are very similar, the habits differ, *pionips* appearing late in the season from river and lake-pools, whereas *lazarensis* and especially *tahoënsis*, hatches very early and can be found when the ground is still snow-covered.

Another representative of this group appears to be *detritus* Hal.; but this is a salt-water breeder and is entirely unrepresented in America.

Further there are two species representing *cataphylla* and *impiger*, the former called *cataphylla*, var. *rostochiensis* Mart. I have some examples of this by the kindness of Dr. Martini, and do not trace any resemblance in the thoracic markings to those of *cataphylla*, with which I am familiar by the personal collection of hundreds of examples. I therefore think that the species should be *A. rostochiensis* Mart., representing our *cataphylla* in Europe, but specifically distinct. In regard to *impiger*, *salinellus* Edw. is its European representative, as Mr. Edwards himself states.

Our desert form, *niphadopsis* D. & K., may be represented in Europe by *A. albescens* Edw. from West Siberia, known only in the female.

Group *curriei*

There are a number of species of this group in Europe, two of which (*pulchritarsis* Rond. and the recently described *berlandi* Séguy) contradict the genitalic character I gave for the group by having a spine on the basal lobe of side-piece. Of the group, one seems certainly common to both continents. The following synonymy will therefore replace one of our familiar names:

Aedes dorsalis Meigen.

- Culex dorsalis* Meigen, Syst. Besch. Zweifl. Ins., vi, 242, 1830.
Culex maculiventris Macquart, Dipt. Exot., Suppl. i, 7, 1846.
Culex curriei Coquillett, Can. Ent., xxxiii, 259, 1901.
Culex onondagensis Felt, Bull. 79, N. Y. Sta. Mus., 278, 1904.
Aedes quaylei Dyar & Knab, Journ. N. Y. Ent. Soc., xiv, 191, 1906.
Culex lativittatus Coquillett, Ent. News, xvii, 109, 1906.
Grabhamia mediolineata Ludlow, Can. Ent., xxxix, 129, 1907.
Grabhamia broquettii Theobald, Entom., xlvi, 179, 1913.
Aedes grahami Ludlow, Ins. Ins. Mens., vii, 154, 1920.

There is in Europe another species, *A. caspius* Pall., closely allied to *dorsalis*, but unrepresented in America. Our own species allied to *dorsalis*, *campestris* D. & K., differs markedly in the genitalia. There seems to be no close representative of our *canadensis* Theo. in Europe, either. It seems rather curious that our *curriei* should be identical when all the others differ, but all stages have been examined carefully without any differences becoming apparent. It is to be noted, however, that the habits of the European *dorsalis* are not the same as those of our *curriei*, since the former is said by Eckstein to breed in flood-water with *sticticus* and *vexans*, which *curriei* never does.

Group *stimulans*

The relationship of these forms is obvious and interesting. I can make but one species common to both Europe and America, by which another of our familiar names disappears, as follows:

Aedes flavescens Müller.

- Culex flavescens* Müller, Faun. Ins. Friedrichdalina, 87, 1764.
Culex lutescens Fabricius, Syst. Ent., 800, 1775.
Culex variegatus Schrank, Enum. Ins. Austr., 482, 1781.
Culex bipunctatus Robineau-Desvoidy, Mém. Soc. Nat. Hist. Paris, iii, 405, 1827.
Culex flavus Motchulsky, Bull. Soc. Imp. Nat. Mosc., xxxii, 503, 1859.
Culex arcanus Blanchard, Les Moust., 303, 1905.
Culex fletcheri Coquillett, U. S. Dept. Agr., Bur. Ent., Tech. Ser. 11, 20, 1906.
Aedes cyprius Ludlow, Ins. Ins. Mens., vii, 158, 1920.

Mr. Edwards queries *flavescens*, *variegatus* and *bipunctatus*; but I am in favor of arbitrarily assigning these old unrecognizable names to the species to which they most probably belong, as was done in the case of some of Walker's types which were indefinite. I have therefore removed the queries, and call the species *flavescens* instead of *lutescens*.

This seems to be the most ancestral form of the group, and I can detect no difference in coloration, male genital structure or larvae between American and European specimens.

The European *maculatus* Meig. is closely represented by our *riparius* D. & K., but the structures are distinctly degenerated in the American form. The European *semicantans* Mart., with *freyi* Edw., which I do not know, forms the basis of our *fitchii* forms. I think that *lesnei* Séguy is the same as either *semicantans* or *freyi*, and not a synonym of the black-legged *sticticus* Meig. as Edwards doubtfully refers it. Our *stimulans* Walk. and *cantator* Coq. appear to represent a development of the ancestral *flavescens* form, in the direction of degeneration, and the type is apparently not represented in Europe.

The *excrucians* series is represented by two species, *annulipes* Meig., which we have nothing like, and a species which Edwards calls *excrucians*, citing *surcoufi* Theo. as a doubtful synonym. The male structures are indeed much like the American *excrucians*; but the larvae, which I have from Dr. Martini, differ distinctly, the air-tube not being drawn out as in our form and without any detached teeth to the pecten. I consider the European form distinct, and if it be shown that the name *surcoufi* Theo. does not apply, a new name will be required. It appears that the male type of *surcoufi* is lost; but males from the type locality may settle the question.

These remarks are based on Dr. Martini's material. I am aware that Wesenberg-Lund figures the larva of what he calls *excrucians* with a drawn-out tube and at least one detached pecten-tooth. Since it is possible that the drawings may be a little exaggerated, it may not be necessary to suppose that two species are involved, and yet that may be the case. Further investigation would do no harm.

There is no such peculiar development in Europe of the *maculatus-fitchii* series as gives rise to our species *grossbecki* D. & K. and *squamiger* Coq. The southern distribution of these is significant of long separation.

Group *thibaulti*

Unrepresented in Europe. Again note the southern distribution of our species.

Group *trichurus*

The European representative is *A. rusticus* Rossi. The relationship is very obvious, but not very close. In this case the American form is the more primitive of the two, *trichurus* not showing the peculiar development of the hairs of the basal lobe of the side-piece which are so marked in *rusticus*.

The peculiar *A. lepidonotus* Edw., with scales on the post-notum, is unrepresented with us.

Group *innuitus*

Mr. Edwards places both *innuitus* and *nearcticus* as synonyms of *alpinus*; but he recognizes also another species, which he names *parvulus*. A reëxamination of my material convinces me that these two species are both circumpolar, occurring together, with the following synonymy:

Aëdes alpinus Linnaeus.

Culex alpinus Linnaeus, Flora Lapp., ed. 2, 381, 1792.

Culex nigripes Zetterstedt, Ins. Lapp., 807 1838.

Aëdes innuitus Dyar & Knab, Ins. Ins. Mens., v, 166, 1917.

Aëdes n. sp. Dyar, Rep. Can. Arc. Exp., iii, Pt. C, 33, 1919.

Ochlerotatus nigripes Wesenberg-Lund, Mem. Acad. Roy. Sci. & Lett. Danemark (8), viii, pl. ix, 1921.

As stated by Edwards, the male hypopygium is heavily chitinized, the aedeagus looking like a pair of strong forceps; the apical lobe is very small; the claspette-filament has a single narrow membranous expansion. The basal lobe is commonly furnished with even, long hairs, thickening progressively toward the margin, in some specimens the last one or two forming moderately strong spines. The larva has the anal segment ringed, the pecten of the air-tube with detached teeth. The

adult is larger, with more white scales on the legs, and somewhat more hairy body.

Aëdes nearcticus Dyar.

Aëdes nearcticus Dyar, Rep. Can. Arc. Exp., iii, Pt. C, 32, 1919.
Aëdes (Ochlerotatus) parvulus Edwards, Bull. Ent. Res., xii, 314, 1921.

The male hypopygium is not heavily chitinized, the aedoeagus inconspicuous; the apical lobe is larger; the claspette-filament has a broader membranous expansion, roundedly angled in the middle. The basal lobe is as in *alpinus*, without or more rarely with a marginal spine. The larva has the anal segment with dorsal plate, the air-tube with evenly spaced teeth. The adult is smaller, with less white scales on the legs, and somewhat less hairy body.

My Greenland material consists entirely of *alpinus*; but both species occurred together in the collections from the Canadian Northwest Territories and arctic Alaska.

The species of the subgenus *Finlaya* are rather numerous in Edwards's list on account of the extent given to his faunal region. The species *A. geniculatus* Oliv. represents our *A. triseriatus* Say, and like it, breeds in tree-holes.

The subgenera *Ecculex* Felt and *Aëdes* Meig. contain the species *voxans* Meig. and *cinereus* Meig., already known to be common to Europe and America.

The subgenus *Stegomyia* contains four species, all of oriental origin. One, *A. aegypti* Linn., occurs with us, but by way of tropical importation only.

Genus **Culex** Linnaeus

Edwards places my subgenus *Neoculex* as synonymous with *Culex* proper, stating that intermediate forms occur. Three species are made common to Europe and America, two by commerce as already well known, the third by way of the holarctic fauna. Edwards calls this species *apicalis* Adams, but I refer to my previous discussion of *testaceus* van der Wulp (Ins. Ins. Mens., vii, 36, 1919). I am since informed that the male type has lost the abdomen. It therefore becomes indefinite and I

would restrict this name to the present species, with which all the characters that can be ascertained agree. Edwards adds to my synonymy the following references:

Culex sergenti Theobald, Mon. Culic., iii, 218, 1903.

Culex pyrenaicus Brolemann, Ann. Soc. Ent. France, lxxxvii, 427, 1919.

In regard to *C. pipiens*, the interesting observation is made that the Californian form *comitatus* D. & K. is identical with the forms *pallens* Coq. from Japan, and that the species was introduced to our west coast from Japan. The eastern *pipiens*, being introduced from Europe, shows the normal type of structure.

Besides the synonymy indicated, Edwards has introduced a number of new characters for generic definition, which will be of great value.

FOUR UNDESCRIBED SPECIES OF LIMNOBIA FROM THE ORIENTAL REGION

(Diptera, Tipulidæ)

BY CHARLES P. ALEXANDER

The high mountains of the Oriental Region support a rich fauna of crane-flies of the tribe Limnobiini. The four undescribed species of *Limnobia* (*Limonia*) were included in material sent to me by Mr. J. B. Corporaal, collected in Sumatra, and by Mr. Teiso Esaki, collected in Formosa or Taiwan. The author's thanks are extended to the collectors of this material for the privilege of retaining the types.

Limnobia megastigma, new species.

General coloration yellow; antennal scape yellow, the flagellum black; mesonotal praescutum with four brown stripes; femora brown with an obscure yellow subterminal ring, the tips black; wings yellow, the stigma very large, brownish black; *r* at tip of R_1 .

Male.—Length, 9 mm.; wing, 11.2 mm.